2017

Session A, 2017 Third Place: A case study on the differences in fecal parasites between ground foraging and canopy foraging birds at Cranberry Lake Biological Station Adirondacks, New York

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Bird Poop

A case study on the differences in fecal parasites between ground foraging and canopy foraging birds at Cranberry Lake Biological Station
Adirondacks, New York.

Ground birds, also known as *Terrestrial* birds

- Stay mainly on ground, prefer to walk/run than fly.
- **Herbivorous** diets of seeds, plants and grains,and ground insects (**grasshoppers, worms, etc)**
- Forage and nest on ground in low shrubs and trees

Canopy birds, also known as *Arboreal* birds

- Rely on trees and dense foliage
- Rarely descend to forest floor.
- Specialized to forage and nest in trees.
- Primarily **insectivorous** and frugivorous

Background: **Birds and Parasites**

Parasites can be fatal to birds and transmitted through feces.

Common parasites seen in birds:

Monocystis

Threadworm eggs

Trichuris eggs

...Hypothesis...

Hypothesis 1: Ground bird species have a higher number of parasites in their droppings per milligram of fecal matter than canopy bird species

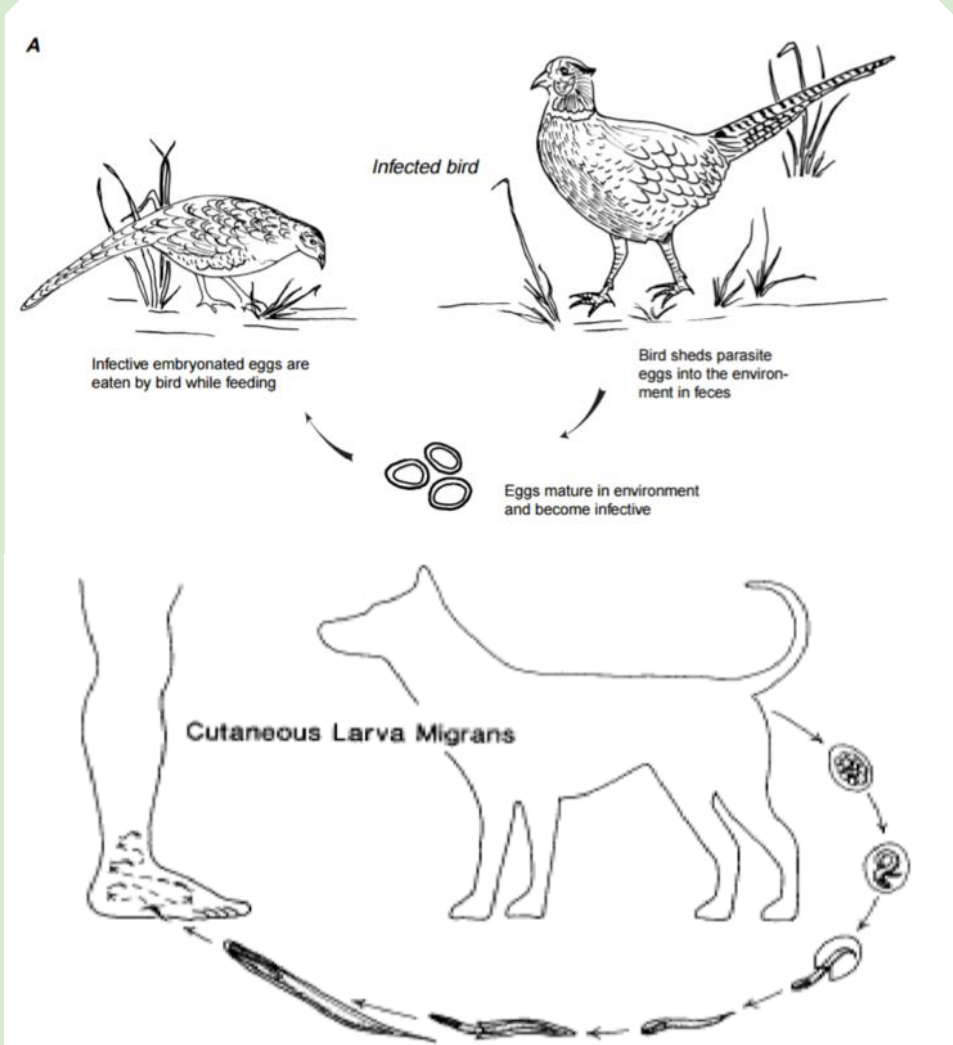
Hypothesis 2: The composition of parasites in the fecal matter of ground birds and canopy birds will be statistically different

...RATIONALE...

Birds that dwell on ground are more exposed to parasites and feces in soil.

More likely to contract wider range of pathogens through increased exposure to human and animal activity.

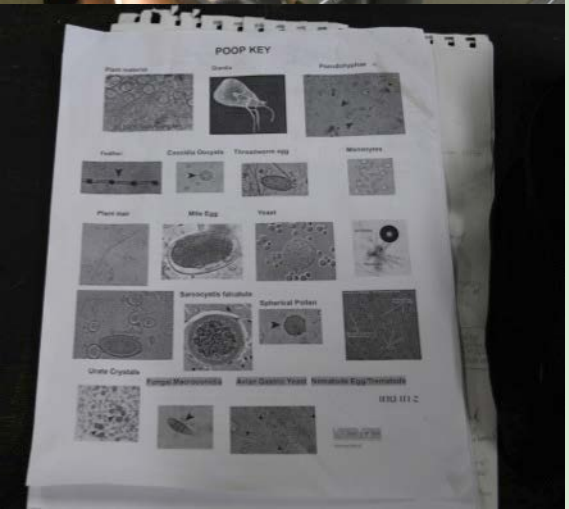
Parasites common in birds can be easily transferred to humans through many vectors (Parasites and Diseases)



http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1014&context=zoonoticspub

Methods

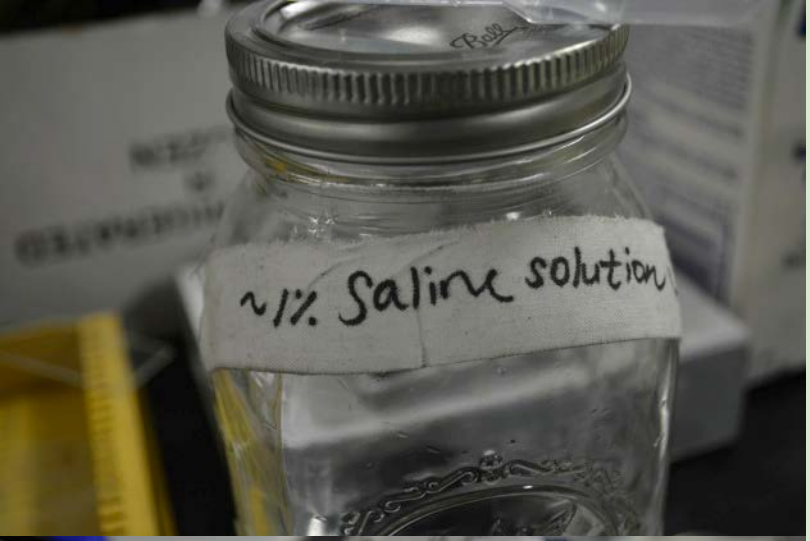
- Canopy droppings
- Ground droppings
- Birds feeders and tarps underneath
- Sample collection and labeling
- Microscope analysis and parasite ID



Fecal Smears

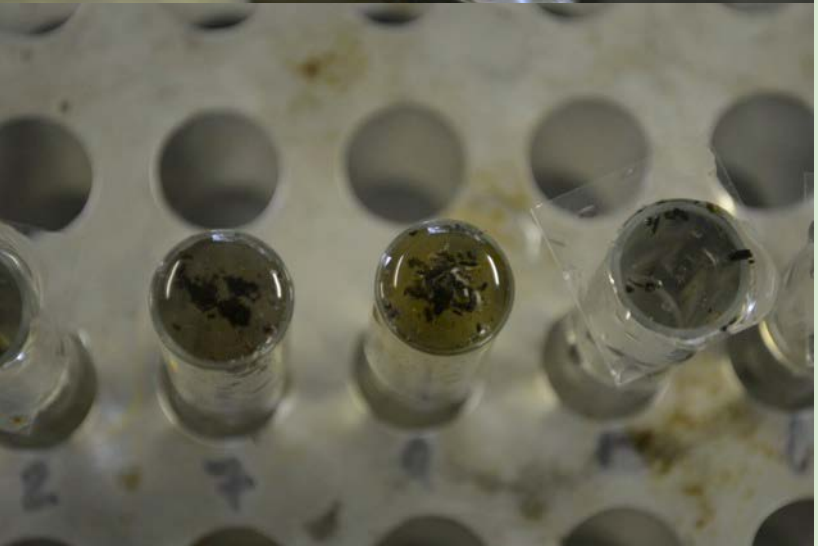
A small amount of sample was measured and placed on **wet mount slide** with saline solution

Slides were examined using a **key** of common wild bird parasites and mis identifiers.



Solutions

- **1% Saline solution** made for wet mount slides of feces.
- **Epsom salt** (magnesium sulfate) and water solution made for **fecal floatation test.**
- Density of parasites is less than density of solution and density of feces is greater than solution



Fecal Floatation Test

➔Epsom solution was dropped into 6 test tubes at a time.

➔Samples were weighed and placed in each, more solution was added until bubble formed.

➔Coverslip placed on top of bubble for rising parasites to stick to and be examined.

Experimental Data

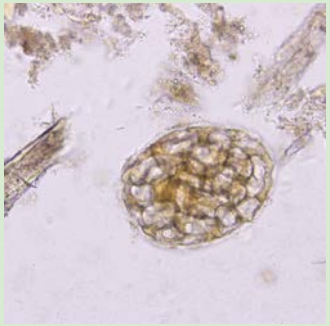
n=27

Sampling unit (feces) =27
Experimental unit (birds)=27

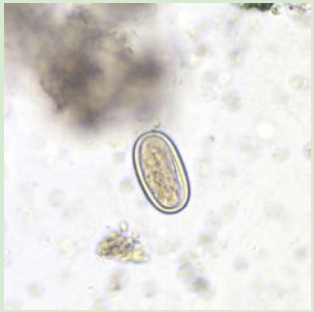
Independent Variable: Canopy or Ground
Dependent Variable: # of Parasites

Commonly Seen Fecal Objects (not Parasites)

Plant hair



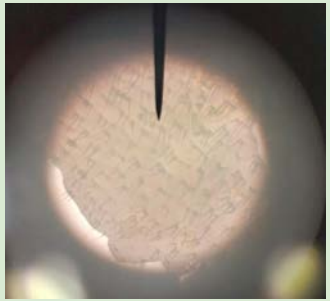
Plant cell



Mushroom spore

Pollen grain

Yeast cell



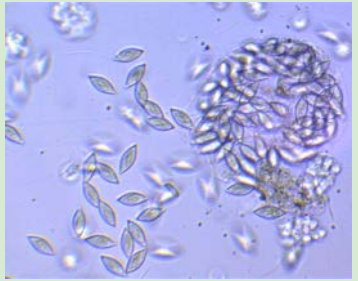
Insect skin

https://www.cdc.gov/dpdx/artifacts/

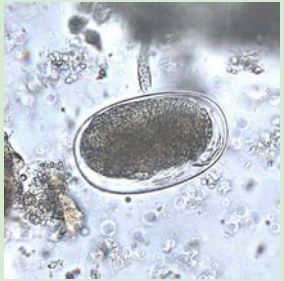
Commonly Seen Parasites...

Threadworm egg

Coccidia Oocysts



Monocystis



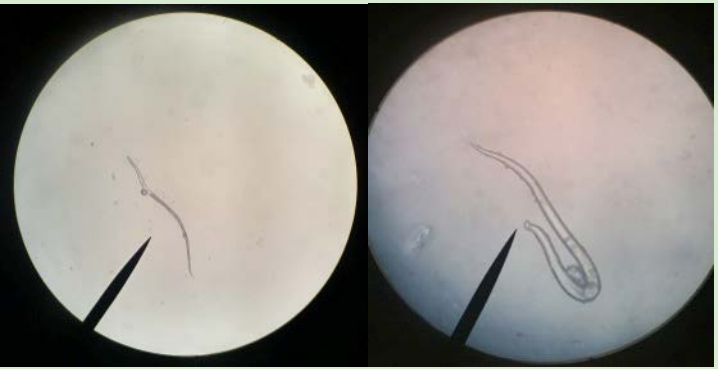
Mite egg

Trichuris egg

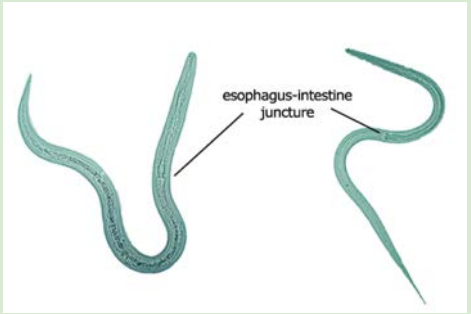
https://www.cdc.gov/dpdx/diagnosticprocedures/stool/morphcomp.html

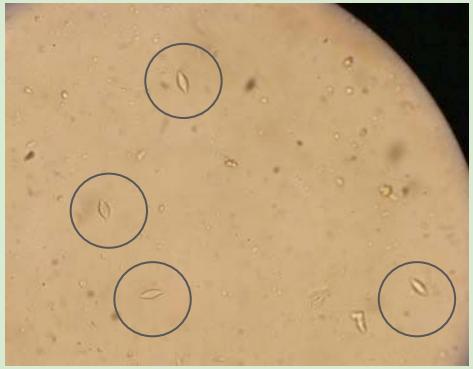
Results

Parasites Found...

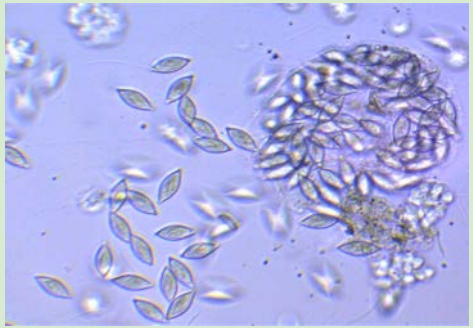


Worm

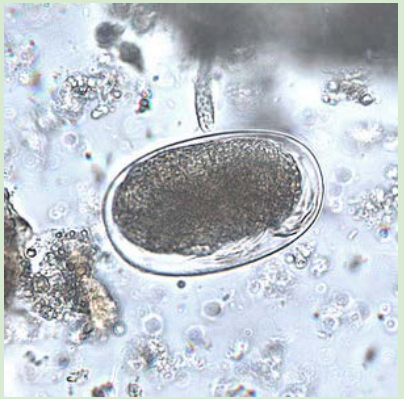




Monocystis



Egg



https://www.cdc.gov/dpdx/diagnosticprocedures/stool/morphcomp.htm

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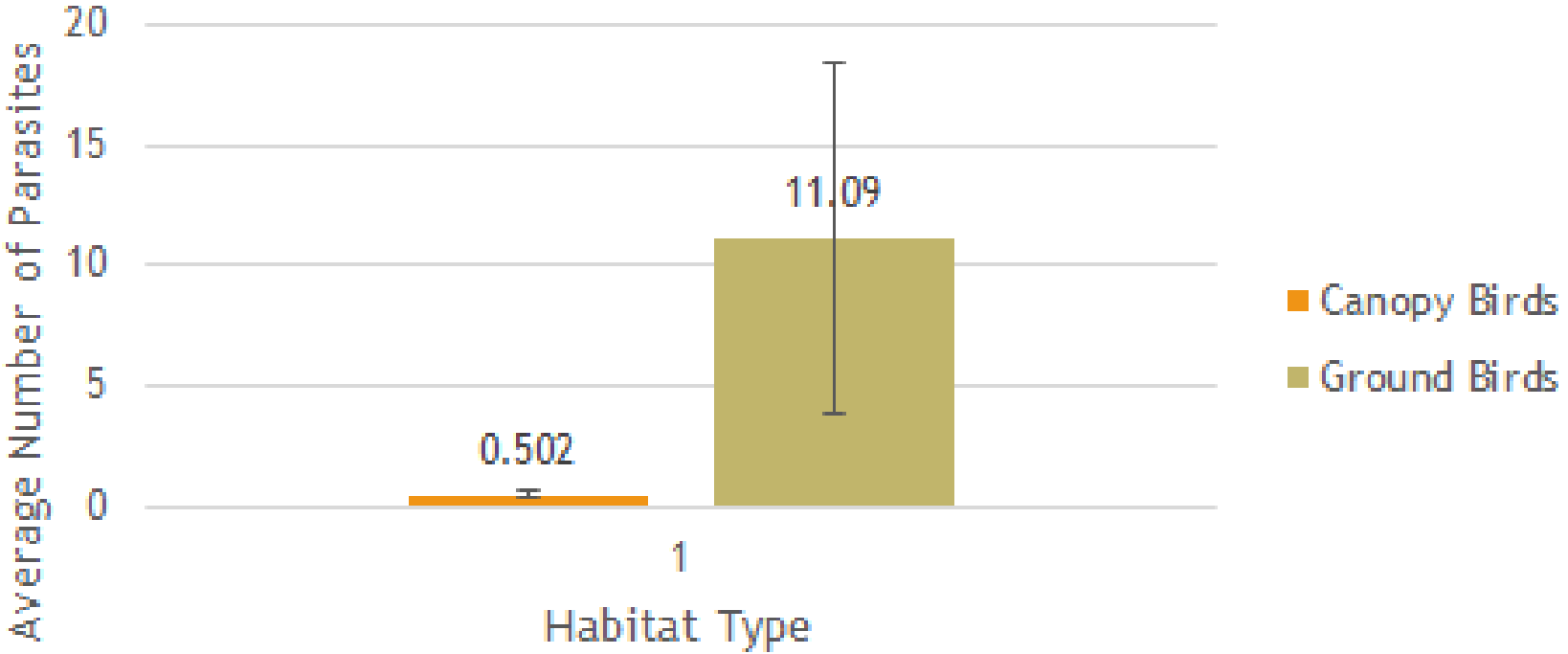
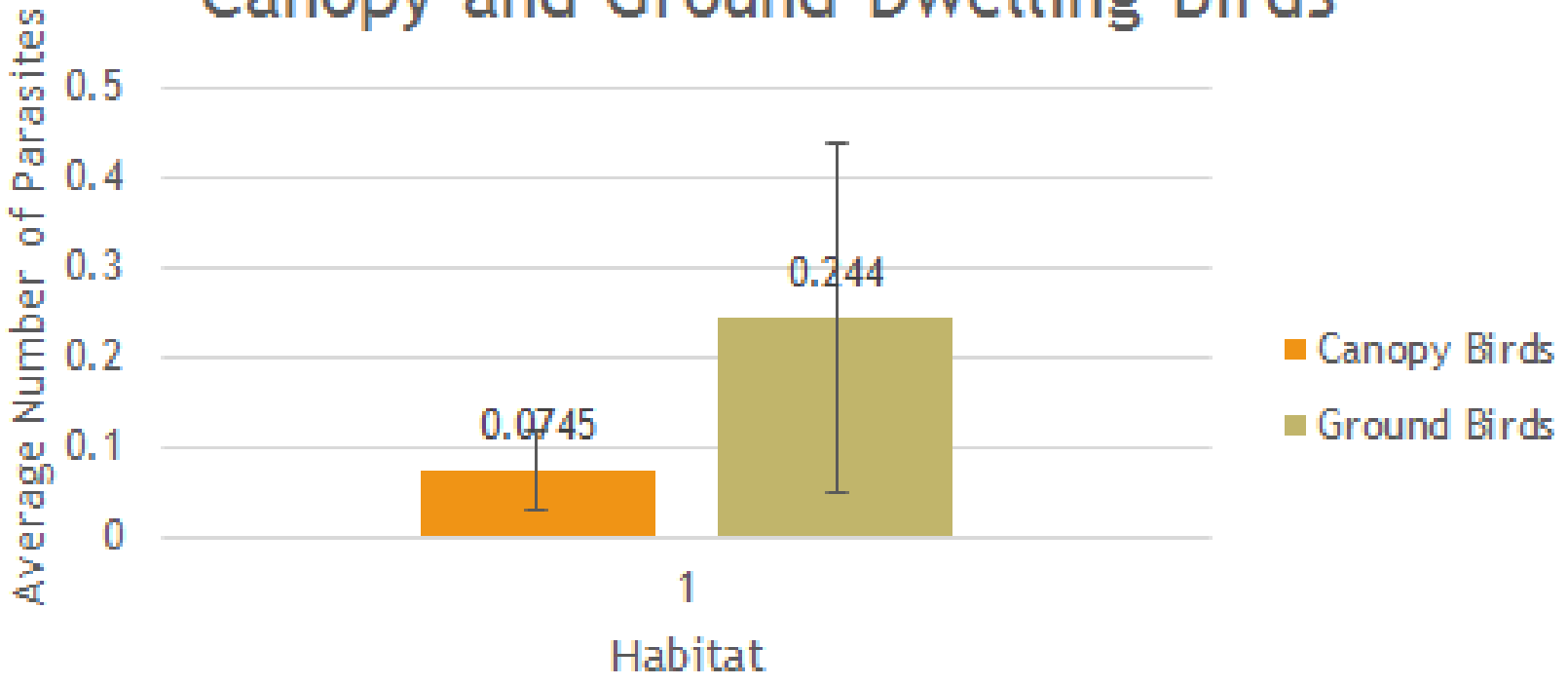
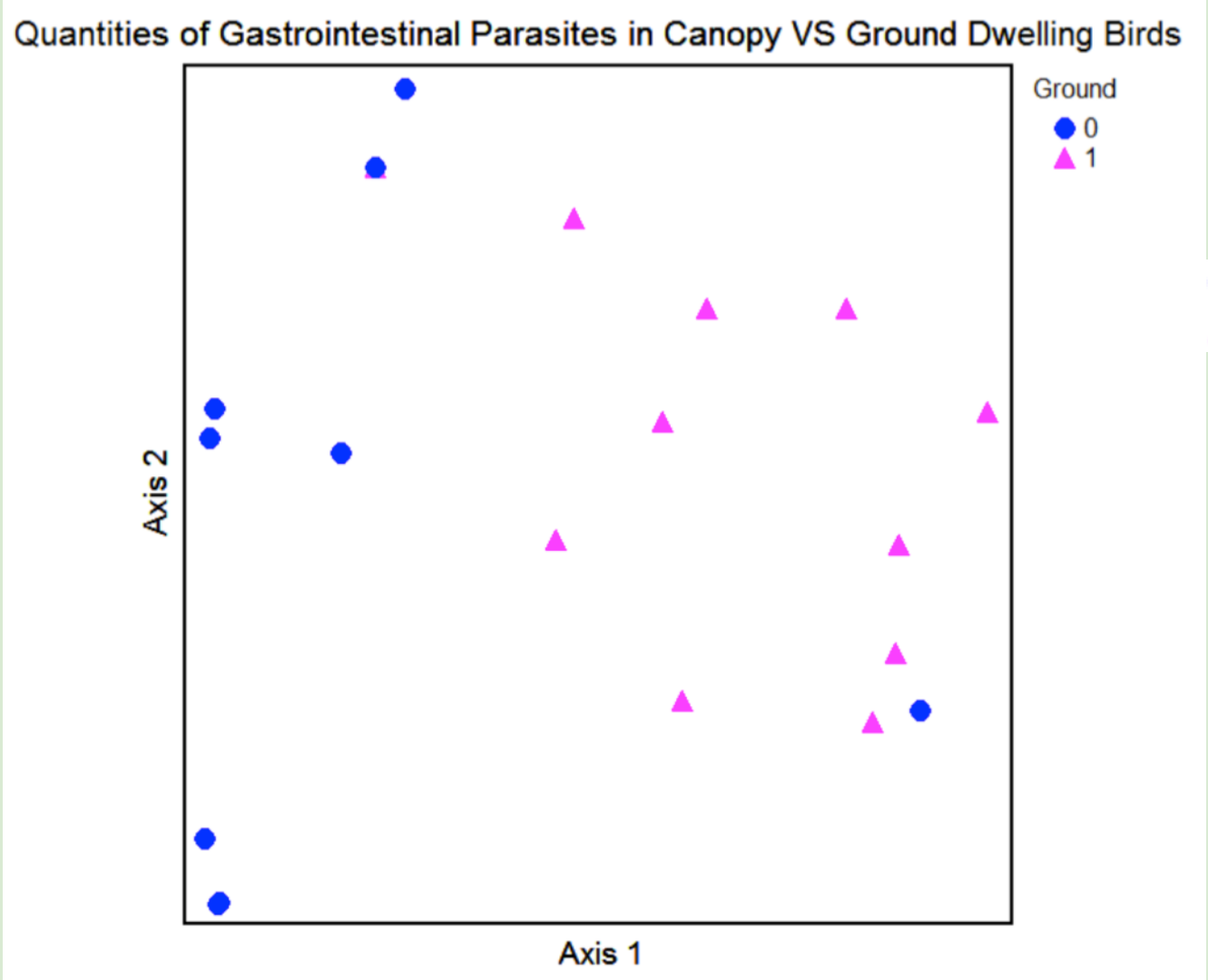
Fecal Smear Average Number of Parasites per mg of Fecal Sample for Canopy and Ground Dwelling Birds



Fecal Float Average Number of Parasites per mg of Fecal Sample for Canopy and Ground Dwelling Birds

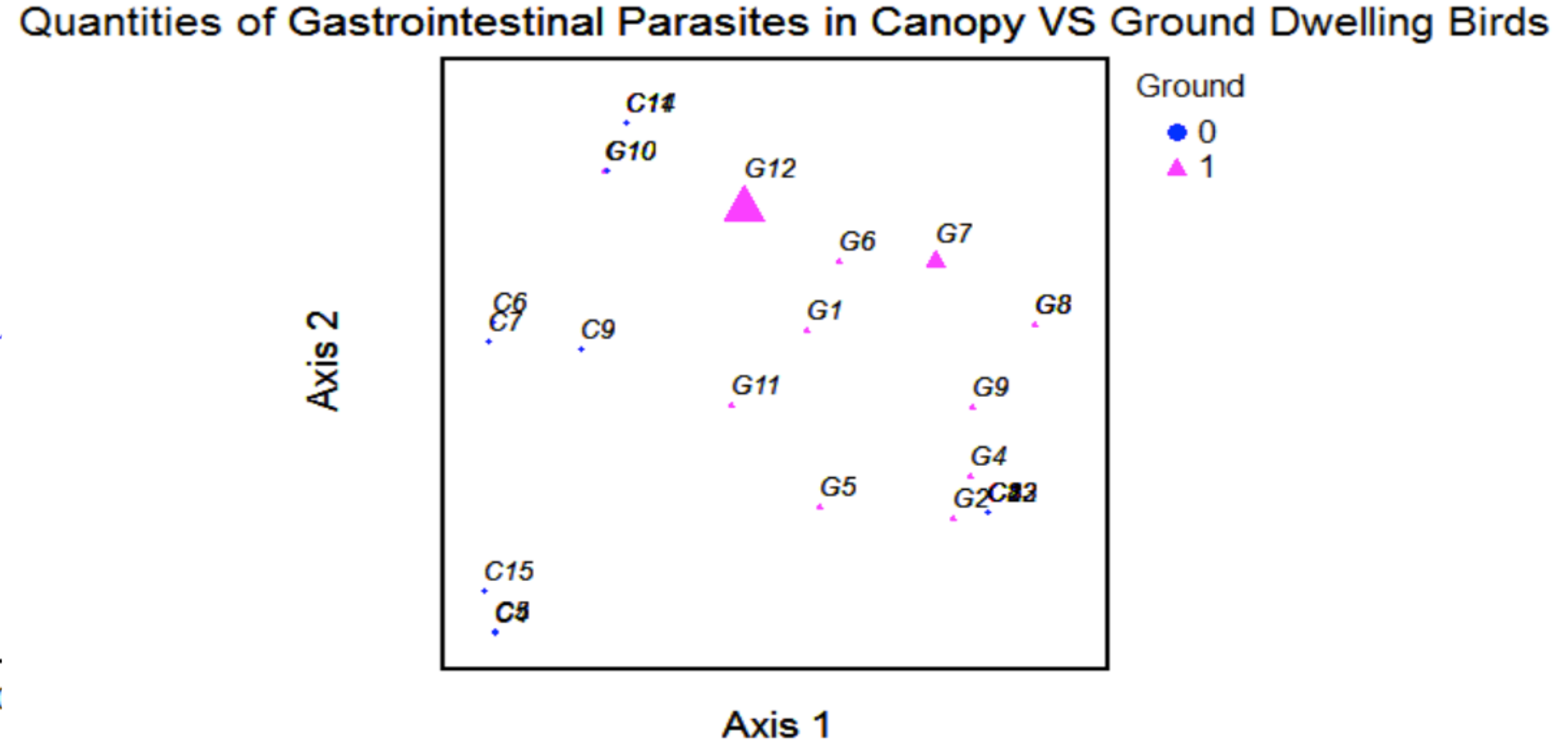




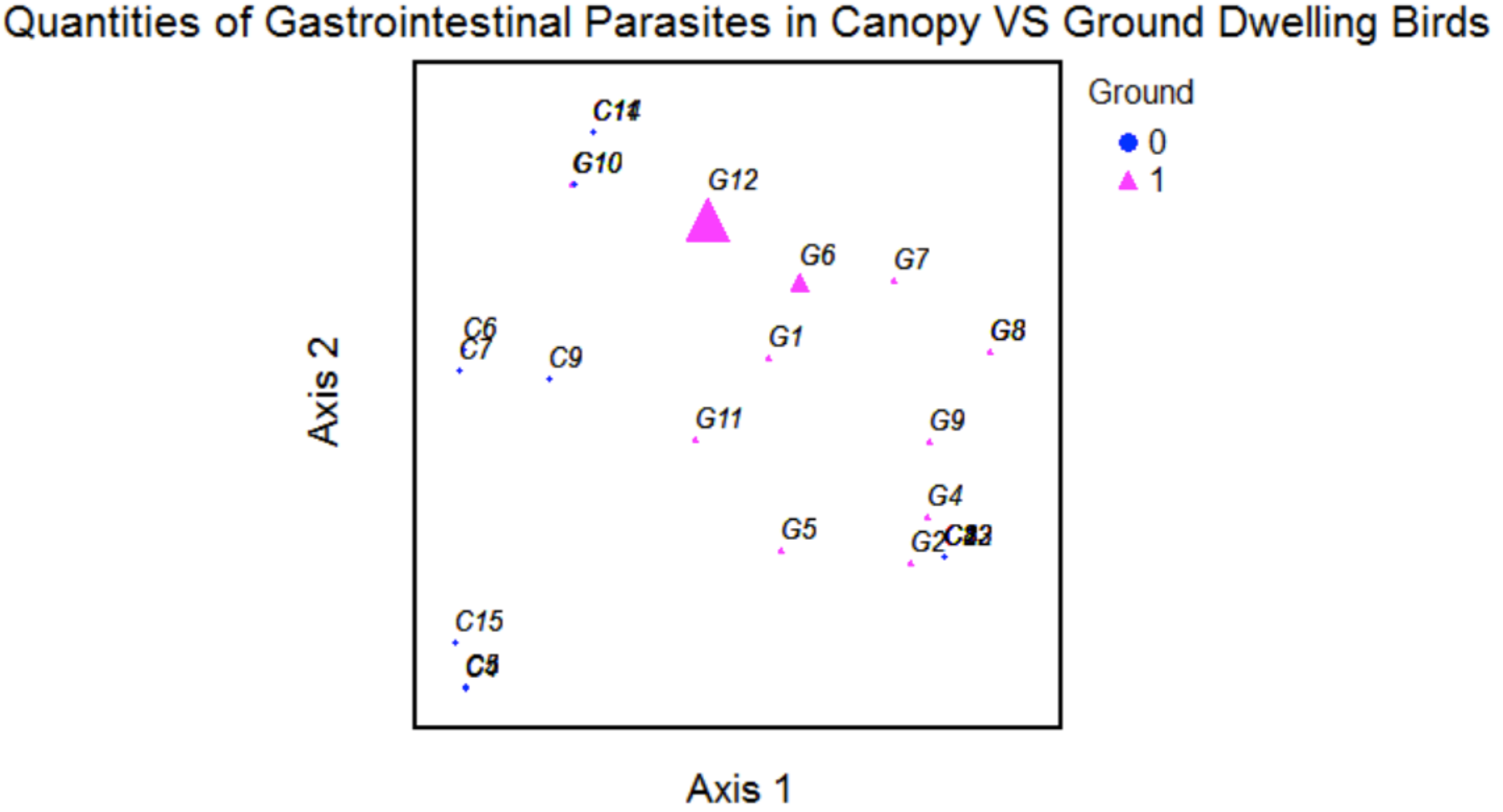
Canopy Dwelling

Ground Dwelling

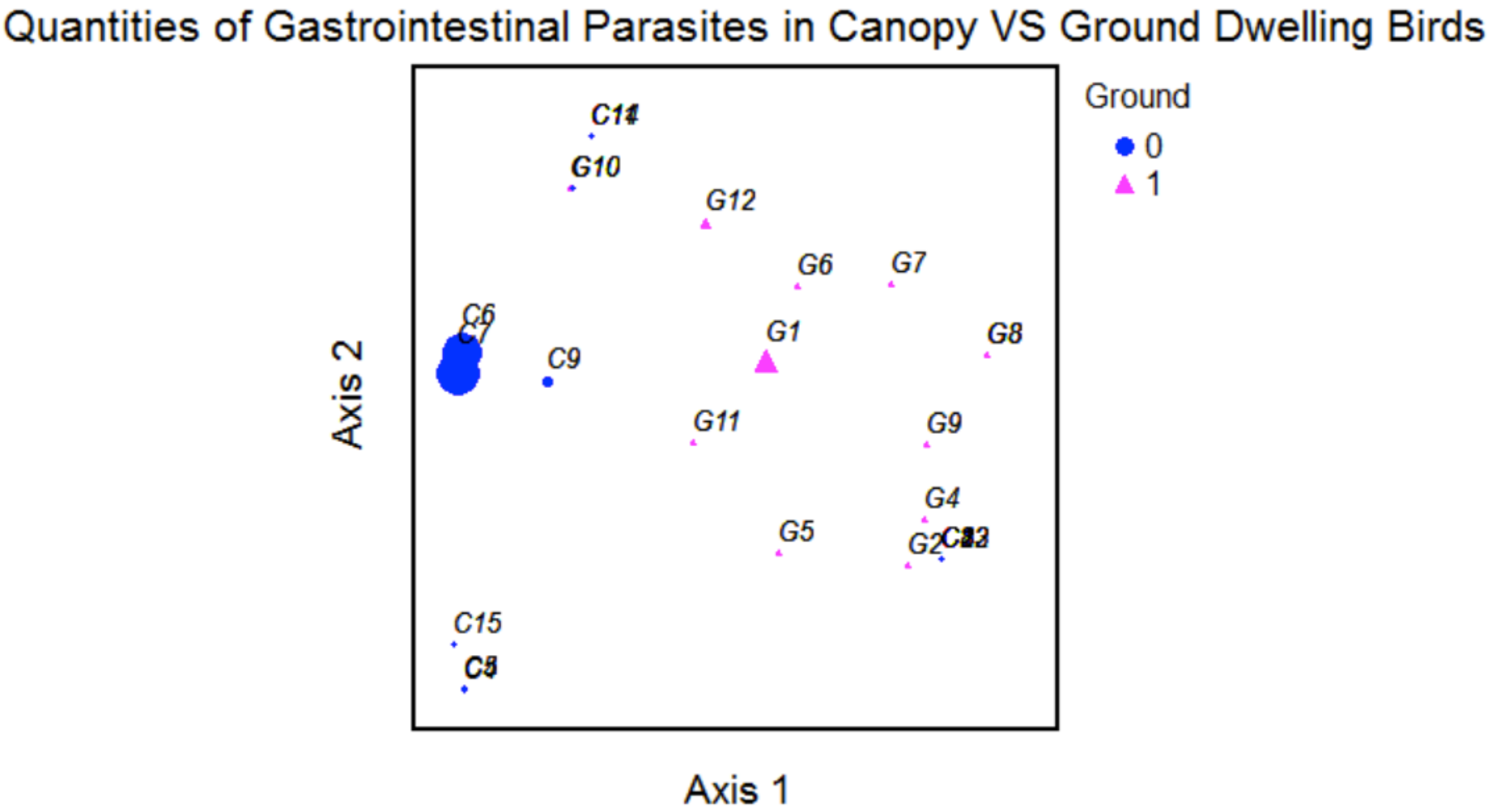
MONOCYSTIS ABUNDANCE



SARCOCYSTIS FALCATULA ABUNDANCE

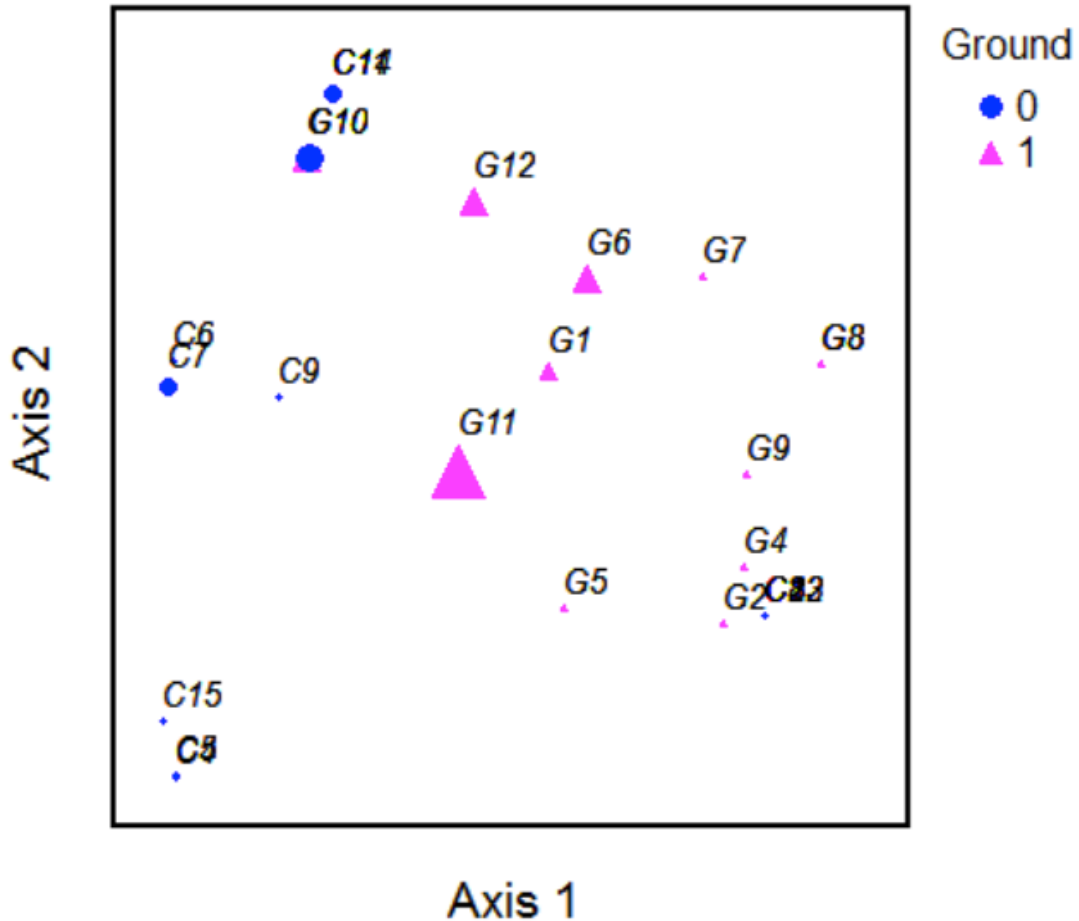


EGG ABUNDANCE



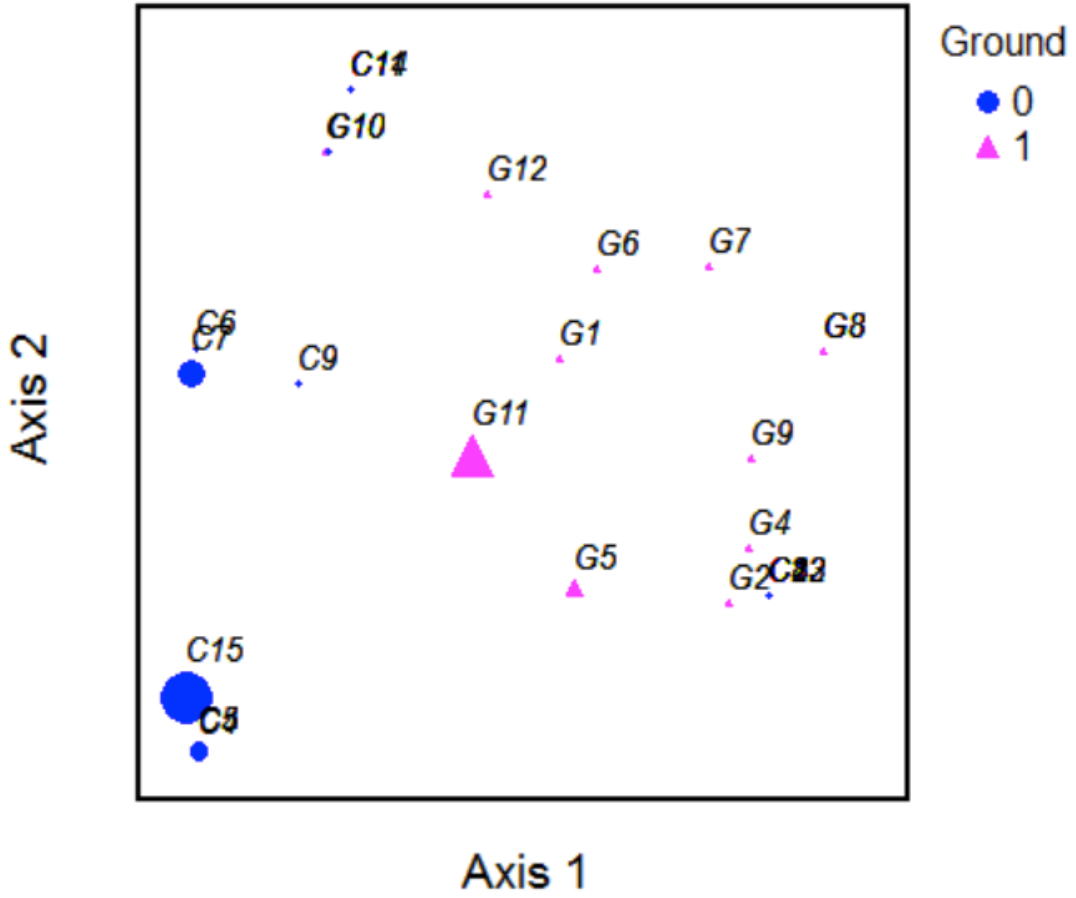
WORM ABUNDANCE

Quantities of Gastrointestinal Parasites in Canopy VS Ground Dwelling Birds



TRICHURIS EGG ABUNDANCE

Quantities of Gastrointestinal Parasites in Canopy VS Ground Dwelling Birds



MRPP Test Results

A=0.13654250

A=1 when there is complete variance between groups and no variance within groups

A=0 when variance within groups equals that which is expected by random chance

A<0 when variance within groups is more than expected by chance

p=0.00063755

Proves the statistical significance between the two groups of birds

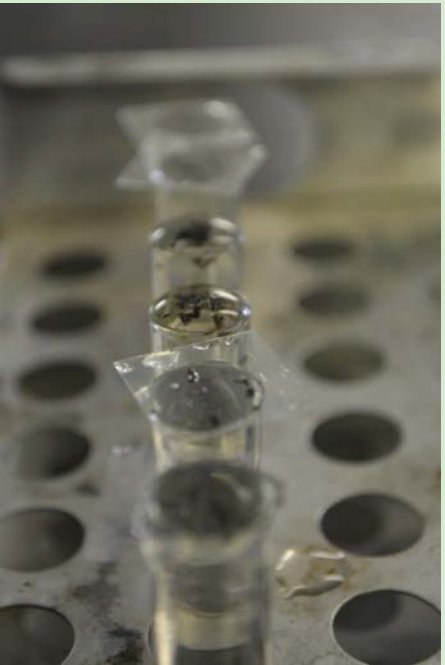
RESULTS

11 times more parasites in sample of ground bird species than canopy bird species per mg of feces for Wet Mount test

4 times more parasites in samples of ground bird species than canopy bird species per mg of feces for Fecal Floatation test

Statistically different types and abundances of parasites between terrestrial and arboreal bird fecal samples

Discussion



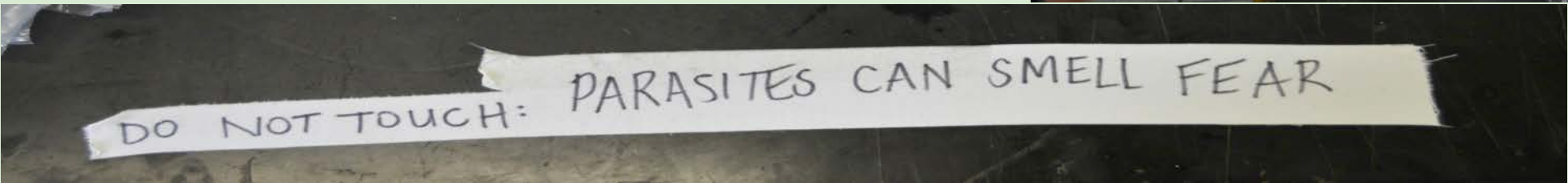
- Important to understand how different types of habitats house different parasites in both richness and abundance.
- Aids future studies in the spread of parasites and awareness of the richness of parasites on ground

Future Methodology

-Increased number of samples taken for improved consistency

-Immediate examination of samples after excretion

-Increased knowledge of Parasitology/Identification process



Future Studies

- More controlled-control the diet or range of birds
- Specific bird species
- Blood samples/DNA testing
- Fish eating vs. Insect eating
- Parasite abundance during different times of year
- Parasite diversity in the same species in different areas

Related Studies and Findings

Host density and human activities mediate increased parasite prevalence and richness in primates threatened by habitat loss and fragmentation (Avian Parasites).

-Habitat modification and seasonality influence avian haemosporidian parasite distributions in southeastern Brazil (Junior, F C, 1999)

-Creating a Homogeneous Avifauna (Blaire, 1970).

Conclusion

We found that there were more parasites per milligram of fecal matter in terrestrial over arboreal birds, and there was a significant differences in the parasite composition and assemblage between the fecal samples of arboreal and terrestrial birds. This leads us to future insight into our likeliness of contracting parasites and spreading parasites to birds.

References Cited

Cole, R. A. (1999, January). Parasites and Parisitic Diseases. Retrieved from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1014&context=zoonoticspub

Cole, R. C. (n.d.). Parasites and Parasitic Diseases (Field Manual of Wildlife Diseases). University of Nebraska (Field Guide to Parasites)

DPDx - Laboratory Identification of Parasitic Diseases of Public Health Concern. (2016, May 03). Retrieved June 08, 2017, from https://www.cdc.gov/dpdx/artifacts/ (Parasite ID)

Finch Care. (n.d.). Retrieved June 08, 2017, from http://www.finchaviary.com/Maintenance/FecalSmear.html (Fecal Floats)

Fecal Float Parasite Pictures Gallery. (n.d.). Retrieved June 08, 2017, from http://www.pet-informed-veterinary-advice-online.com/fecal-float.html (Pictures and examples of FF parasites)

Junior, F. C., Rodrigues, R. A., Ellis, V. A., Leite, L. O., Borges, M. A., & Braga, É M. (n.d.). Habitat modification and seasonality influence avian haemosporidian parasite distributions in southeastern Brazil. Retrieved June 08, 2017, from http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0178791

Mbora, D. N., & McPeek, M. A. (2008, October 03). Host density and human activities mediate increased parasite prevalence and richness in primates threatened by habitat loss and fragmentation. Retrieved June 08, 2017, from http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2656.2008.01481.x/full

Robert B. Blair (7). (1970, January 01). Creating a Homogeneous Avifauna. Retrieved June 08, 2017, from https://link.springer.com/chapter/10.1007%2F978-0-387-73412-5_27

Sakas, P. A. (n.d.). Common Avian Parasites [Pamphlet]. Niles, IL: Niles Animal Hospital and Bird Medical Center (Parasite ID)

Methods photography provided by Adrianna Calamita

Questions?